

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

This following listing of the currently pending claims replaces all prior versions.

1. (Original) A fault detection method comprising:
sensing a group of correlating operational parameters of a semiconductor processing tool operating under a recipe;
sensing at least one non-correlating operational parameter of the tool operating under the recipe;
forming an input vector including the group of correlating operational parameters and the at least one non-correlating operational parameter;
comparing the input vector to a reference data library comprising vectors from previous tool runs utilizing the recipe;
selecting from the reference data library one or more nearest neighbor vectors to the input vector based upon a similarity with the group of correlating operational parameters; and
generating a fault detection index from the selected nearest neighbor vectors.
2. (Original) The method of claim 1 wherein sensing the group of correlating operational parameters comprises sensing operational parameters relating to tool pressure.
3. (Original) The method of claim 1 wherein sensing the group of correlating operational parameters comprises sensing operational parameters relating to tool temperature.
4. (Original) The method of claim 1 wherein sensing the group of correlating operational parameters comprises sensing operational parameters relating to tool power.

5. (Original) The method of claim 1 wherein sensing the group of correlating operational parameters comprises sensing operational parameters relating to positioning of a wafer within the tool.

6. (Original) The method of claim 1 wherein the fault detection index is generated by compiling a vector subset from the selected nearest neighbor vectors, combining the vector subset into an output prediction vector, and generating a fault detection index from the output prediction vector.

7. (Original) The method of claim 6 wherein the output vector comprises predicted operational parameters, and the fault detection index is generated by combining the predicted operational parameters.

8. (Original) The method of claim 7 wherein combining the operational parameters of the output prediction vector comprises:
assigning a set of weights to the predicted operational parameters; and
adding together the weighted operational parameters.

9. (Original) The method of claim 8 wherein the set of weights is assigned based upon the similarity.

10. (Original) The method of claim 1 further comprising:
including in the input vector a value of a passive-inclusive sensor,
ignoring the value of the passive-inclusive sensor in selecting the nearest neighbor vectors; and
including the value of the passive-inclusive sensor in generating the fault detection index.

11. (Original) The method of claim 1 further comprising:
including in the input vector a value of a cluster sensor;
including the value of the cluster sensor in selecting the nearest neighbor vectors;
and

ignoring the cluster sensor in generating the fault detection index.

12. (Original) The method of claim 11 wherein the cluster sensor represents a stage in a semiconductor fabrication process when the group of correlating operational parameters is sensed.

13. (Original) The method of claim 6 wherein the vectors of the reference data library include a synthetic sensor, the method further comprising:

including in the input vector a null value of the synthetic sensor; and

obtaining a predicted value of the synthetic sensor from the output prediction vector, the synthetic sensor ignored in selecting the nearest neighbor vectors and ignored in generating the fault detection index.

14. (Original) The method of claim 13 wherein the synthetic sensor is difficult or impossible to measure in real time during operation of the semiconductor fabrication tool, and is assigned to vectors of the library after completion of the processing.

15. (Original) An apparatus for detecting a fault in a semiconductor processing tool, the apparatus comprising:

a first sensor, a second sensor, and a third sensor operatively coupled to the semiconductor processing tool;

a controller in communication with the semiconductor processing tool and with the first, second, and third sensors;

a memory coupled to the controller, the memory storing a computer program in computer readable format including computer instructions to control said controller to,

receive from the first and second sensors correlating operational parameters of the semiconductor processing tool operating under a recipe,

receive from the third sensor a non-correlating operational parameter from the tool;

compare the correlating operational parameters to corresponding operational parameters recorded during prior runs of the tool utilizing the recipe, and

generate a fault detection index from comparing the sensed correlating operational parameters to the corresponding operational parameters recorded during prior runs.

16. (Original) The apparatus of claim 15 wherein the correlating operational parameters relate to tool pressure.

17. (Original) The apparatus of claim 15 wherein the correlating operational parameters relate to tool temperature.

18. (Original) The apparatus of claim 15 wherein the correlating operational parameters relate to tool power.

19. (Original) The apparatus of claim 15 wherein the correlating operational parameters relate to positioning of a wafer within the tool.